1. The equation $x^{\log_x (2+x)^2} = 25$ holds for

(a) $x = 6$ (b) $x = -3$ (c) $x = 3$ (d) $x = 7$

2. $\frac{2}{3!} + \frac{4}{5!} + \frac{6}{7!} + \ldots\ldots \infty =$

(a) e (b) 2 e (c) e^2 (d) 1/e

3. $\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} + \ldots\ldots \infty =$

(a) $\log_e\left(\frac{4}{e}\right)$ (b) $\log_e \frac{e}{4}$ (c) $\log_e 4$ (d) $\log_e 2$

4. $0.5 - \frac{(0.5)^2}{2} + \frac{(0.5)^3}{3} - \frac{(0.5)^4}{4} + \ldots\ldots$

(a) $\log_e\left(\frac{3}{2}\right)$ (b) $\log_{10}\left(\frac{1}{2}\right)$

(c) $\log_e(n!)$ (d) $\log_e\left(\frac{1}{2}\right)$

5. Both the roots of given equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ are always

(a) Positive (b) Negative (c) Real (d) Imaginary

6. If 3 is a root of $x^2 + kx - 24 = 0$, it is also a root of

(a) $x^2 + 5x + k = 0$ (b) $x^2 - 5x + k = 0$

(c) $x^2 - kx + 6 = 0$ (d) $x^2 + kx + 24 = 0$

7. For what values of k will the equation $x^2 - 2(1+3k)x + 7(3+2k) = 0$ have equal roots

(a) 1, –10/9 (b) 2, –10/9 (c) 3, –10/9 (d) 4, –10/9

8. If the roots of the equation $x^2 - 5x + 16 = 0$ are α, β and the roots of equation $x^2 + px + q = 0$ are $\alpha^2 + \beta^2$, $\alpha\beta/2$, then

(a) $p = 1, q = -56$ (b) $p = -1, q = -56$

(c) $p = 1, q = 56$ (d) $p = -1, q = 56$

9. If one root of a quadratic equation is $\frac{1}{2+\sqrt{5}}$, then the equation is

(a) $x^2 + 4x + 1 = 0$ (b) $x^2 + 4x - 1 = 0$

(c) $x^2 - 4x + 1 = 0$ (d) None of these

10. If $\left(\frac{3}{4}\right)^x = 7$ then x =

(a) $\frac{\log 7}{\log 4 - \log 3}$ (b) $\log_7(3/4)$

(c) $\frac{\log 7}{\log 3 - \log 4}$ (d) $\log_7(4/3)$

11. If α, β be the roots of $ax^2 + bx + c = 0$; γ, δ be the roots of $px^2 + qx + r = 0$; and D_1, D_2 the respective discriminants. If $\alpha, \beta, \gamma, \delta$ are in A.P. then $D_1 : D_2$ =

(a) $\frac{a^2}{b^2}$ (b) $\frac{a^2}{p^2}$ (c) $\frac{b^2}{q^2}$ (d) $\frac{c^2}{r^2}$

12. For the equation $3x^2 + px + 3 = 0$, $p > 0$, if one of the roots is square of other, than p =

(a) 1/3 (b) 1 (c) – 6 (d) 3

13. If the roots of the equation $\frac{x^2 - bx}{ax - c} = \frac{\lambda - 1}{\lambda + 1}$ are such that $\alpha + \beta = 0$, then the value of λ is-

(a) $\frac{a-b}{a+b}$ (b) c (c) $\frac{1}{c}$ (d) $\frac{a+b}{a-b}$

14. If the roots of $a_1x^2 + b_1x + c_1 = 0$ are α_1, β_1, and those of $a_2x^2 + b_2x + c_2 = 0$ are α_2, β_2 such that $\alpha_1\alpha_2 = \beta_1\beta_2 = 1$ then-

(a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (b) $\frac{a_1}{c_2} = \frac{b_1}{b_2} = \frac{c_1}{a_2}$

(c) $a_1a_2 = b_1b_2 = c_1c_2$ (d) None of these

15. If the sum of the first 2*n* terms of 2, 5, 8…. is equal to the sum of the first *n* terms of 57, 59, 61…., then *n* is equal to

(a) 10 (b) 12 (c) 11 (d) 13

16. The sum of *n* terms of the series $\frac{1}{1+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{7}} + \ldots\ldots$ is

(a) $\sqrt{2n+1}$ (b) $\frac{1}{2}\sqrt{2n+1}$

(c) $\sqrt{2n-1}$ (d) $\frac{1}{2}(\sqrt{2n+1} - 1)$

17. The sum of first two terms of a G.P. is 1 and every term of this series is twice of its previous term, then the first term will be

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{4}$

18. If *a*, *b*, *c*are in A.P. $b-a$, $c-b$ and *a* are in G.P., then $a:b:c$ is

(a) 1 : 2 : 3 (b) 1 : 3 : 5 (c) 2 : 3 : 4 (d) 1 : 2 : 4

19. If a, b, c are in H.P. , then the value of $\frac{b+a}{b-a}+\frac{b+c}{b-c}$ is

(a) 0 (b) 1 (c) 2 (d) 3

20. If the sixth term of an A.P. is equal to 2. the value of the common difference of the A.P. which makes the product $a_1\, a_4\, a_5$ the greatest is (the i^{th} term is denoted by a)

(a) $\frac{8}{5}$ (b) 3 (c) 2 (d) $\frac{4}{5}$

21. $C_1+2C_2+3C_3+....^nC_n=$

(a) 2^n (b) $n.2^n$ (c) $n.2^{n-1}$ (d) $n.2^{n+1}$

22. The co-efficient of y in the expansion of $(y^2+c/y)^5$ is

(a) $10\,c^3$ (b) $20\,c^2$ (c) 10 c (d) 20 c

23. The number of prime factors of the coefficient of x^8 in the expansion of $(1-2x+3x^2-4x^3+5x^4-6x^5+7x^6)^6$is-

(a) 3 (b) 4 (c) 5 (d) 6

24. The value of $(n+2).C_0\,2^{n+1}-(n+1).C_1 2^n+n.C_2\,2^{n-1}$ ... is

(a) 4(1 + n) (b) 4n (c) 2n (d) 2(n + 2)

25. The number of rational term in the expansion of $(1+\sqrt{2}+\sqrt[3]{5})^6$ is -

(a) 7 (b) 10 (c) 11 (d) None of these

26. The number of ways in which 5 beads of different colours form a necklace is

(a) 12 (b) 24 (c) 120 (d) 60

27. There are 20 persons among whom are two brothers. The number of ways in which we can arrange them around a circle so that there is exactly one person between the brothers is

(a) 19! (b) $2\times 18!$ (c) 2! 17! (d) None of these

28. In the above question, the no. of ways can this be done such that n(P) = n(Q)

(a) 2^n (b) 4^n (c) 3^n (d) $2nC_n$

29. The no. of dissimilar terms in the expansion of $(a+b+c)^{10}$ is

(a) 66 (b) 60 (c) 11 (d) 45

30. The number of ways in which 52 cards can be distributed among four players, each receiving 13 cards, is

(a) $\frac{\angle 52}{(\angle 13)^4 \text{x} 4}$ (b) $\frac{\angle 52}{(\angle 13)^4}$

(c) $\frac{\angle 52}{(\angle 13)^4\ \angle 4}$ (d) None

31. Which of the following species has unpaired electrons?

(a) N_2 (b) F_2 (c) O_2^- (d) O_2^{2-}

32. Which of the following molecules is paramagnetic in nature?

(a) H_2 (b) Li_2 (c) B_2 (d) N_2

33. On the basis of intermolecular forces predict the correct order of decreasing boiling points of the compounds –

(a) $CH_3OH > H_2 > CH_4$ (b) $CH_3OH > CH_4 > H_2$

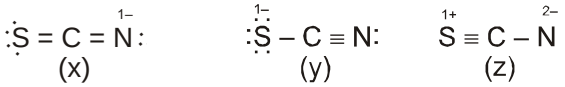
(c) $CH_4 > CH_3OH > H_2$ (d) $H_2 > CH_4 > CH_3OH$

34. The hybridisation of the underline atom changes in :

(a) AlH_3 changes to AlH_4^- (b) H_2O changes to H_3O^+

(c) NH_3 changes to NH_4^+ (d) In all cases

35. In the thiocyanate ion, SCN^- three resonating structure are possible with the electron-dot method as shown in figure :



The decreasing order of % contribution in resonance hybrid is :

(a) y> x > z (b) y > z > x

(c) z> x > y (d) Cannot predicted.

36. The correct order of C–N bond length in the given compounds is :

P : CH_3CN Q : HNCO R : CH_3CONH_2

(a) P > Q > R (b) P = Q = R

(c) R > Q > P (d) R > P > Q

37. An ionic bond $A^+ B^-$ is most likely to be formed when :

(a) The ionization energy of A is high and the electron affinity of B is low

(b) The ionization energy of A is low and the electron affinity of B is high

(c) The ionization energy of A and the electron affinity of B is high

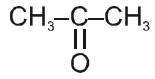
(d) The ionization energy of A and the electron affinity of B is low

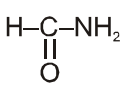
38. Which of the following contains both electrovalent and covalent bonds ?

(a) $MgCl_2$ (b) H_2O

(c) NH_4Cl (d) none

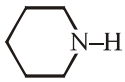
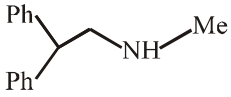
39. Which type of hybridisation of each carbon have in the following compounds?

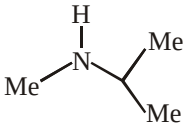
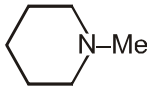
(a) $CH_3–Cl$ (b) 

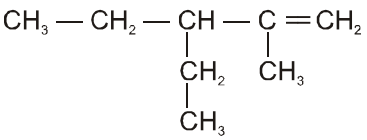
(c) $CH_3–C\equiv N$ (d) 

	(a)	(b)	(c)	(d)
(a)	sp^3	sp^3 & sp^2sp^3	& sp^2	sp
(b)	sp^2	sp^3 & $spsp^3$	& sp	sp^2
(c)	sp^3	sp^3 & sp^2sp^3	& sp	sp^2
(d)	sp^2	sp^3 & $spsp^3$	& sp^2	sp

40. Identify the 3° amines?

(a)  (b) 

(c)  (d) 

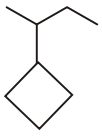
41. IUPAC name of  is :

(a) 2-Methyl-3-ethyl-1-pentene

(b) 3-Ethyl-4-methyl-4-pentene

(c) 3-Ethyl-2-methyl-1-pentene

(d) 3-Methyl-2-ethyl-1-pentene

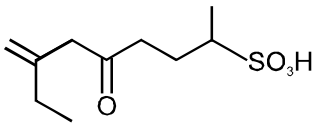
42. IUPAC name for  is :

(a) (1-Methylpropyl)cyclobutane

(b) 2-(n-butyl)cyclobutane

(c) 2-Cyclobutylbutane

(d) 1-Cyclobutylbutane

43. The correct IUPAC name of the compound  is :

(a) 6-Ethyl-1-methyl-4-oxohept-6-ene-1-sulphonic acid

(b) 7-Ethyl-5-oxooct-7-ene-2-sulphonic acid

(c) 2-Ethyl-7-sulphooct-1-ene-4-one

(d)7-Methylene-5-oxononane-2-sulphonic acid

44. The IUPAC name of the

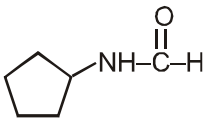
$$CH_3CH=CH-CH_2-\underset{\displaystyle NH_2}{\underset{|}{CH}}-CH_2COOH$$ is :

(a) 3-Aminohept-5-enoic acid

(b) 5-Aminohex-2-enecarboxylic acid

(c) 3-Aminohept-4-enoic acid

(d) 5-Aminohept-2-enoic acid

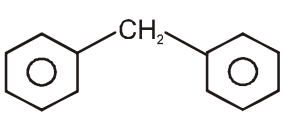
45. IUPAC name of the compound  is :

(a) N-Cyclopentylamide

(b) N-Cyclopentylmethanamide

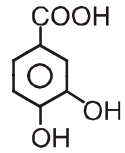
(c) Cyclopentanemethanamide

(d) N-Aminocyclopentylmethanal

46. IUPAC name of the  :

(a) Methyldibenzene (b) Isophenyl methane

(c) Dimethylbenzene (d) Diphenyl methane

47. The IUPAC name of  is :-

(a) 3,4-Dihydroxybenzenecarboxylic acid

(b) 1,2-Dihydroxybenzoic acid

(c) 4-Carboxy-2-hydroxy phenol

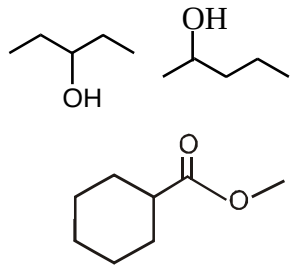
(d) 4-Carboxybenzene-1,2-diol

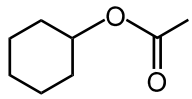
48. Compounds with same molecular formula but different structural formulae are called :

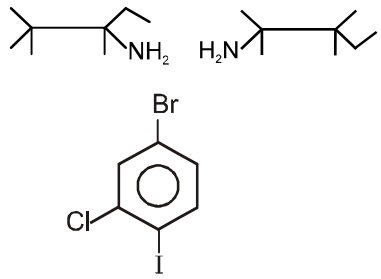
(a) Isomers (b) Isotopes

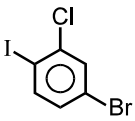
(c) Isobars (d) Isoelectric

49. Which of the following is a pair of metamers ?

(a) 

(b) 

(c) 

(d) 

50. A position isomer of 2-pentanone is :

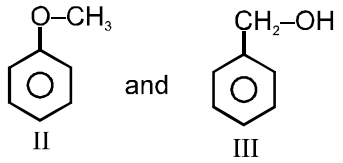
(a) 3-Pentanone

(b) 3-Methyl-2-butanone

(c) 1-Pentanal

(d) 2,2-Dimethylpropanal

51. Identify the relationship among the followings :



II III

(a) Chain Isomers (b) Functional isomers

(c) Metamers (d) Position Isomers

52. $BrCH_2–CH_2–CH=O$ and $CH_3–CH_2–\underset{\underset{Br}{|}}{C}=O$ are

(a) Functional isomers (b) Position isomers

(c) Chain isomers (d) Metamers

53. Na_2CO_3 can be manufactured by Solvey's process but K_2CO_3 cannot be prepared because

(a) K_2CO_3 is more soluble

(b) K_2CO_3 is less soluble

(c) $KHCO_3$ is more soluble than $NaHCO_3$

(d) $KHCO_3$ is less soluble than $NaHCO_3$

54. Which one is used as a bye-product in Serpeck's process

(a) NH_3 (b) CO_2

(c) N_2 (d) PH_3

55. Chemical formula for the phosphorus molecule is

(a) P (b) P_4

(c) P_2 (d) P_5

56. Among the following nitrates, *Lead nitrate, Silver nitrate* and *Ammonium nitrate;* the one that decomposes without leaving any solid residue is

(a) Lead nitrate (b) Ammonium nitrate

(c) Silver nitrate (d) Sodium nitrate

57. Nitrogen dioxide cannot be obtained by heating

(a) KNO_3 (b) $Pb(NO_3)_2$

(c) $Cu(NO_3)_2$ (d) $AgNO_3$

58. $(NH_4)_2Cr_2O_7$ on heating liberates a gas. The same gas will be obtained by

(a) Heating NH_4NO_2

(b) Heating NH_4NO_3

(c) Treating H_2O_2 with $NaNO_2$

(d) Treating Mg_3N_2 with H_2O

59. Most acidic oxide is

(a) Na_2O (b) ZnO

(c) MgO (d) P_2O_5

60. Halogen acid used in the preparation of aqua regia is

(a) *HBr* (b) *HI*

(c) *HCl* (d) *HF*

61. Hydrogen iodide cannot be prepared by the action of conc. H_2SO_4 on potassium iodide because

(a) HI is stronger than H_2SO_4

(b) HI is more volatile than H_2SO_4

(c) H_2SO_4 is an oxidising agent

(d) H_2SO_4 forms complex

62. Whose bond energy is maximum

(a) F_2 (b) Cl_2

(c) Br_2 (d) I_2

63. A body of mass *m kg* is lifted by a man to a height of one metre in 30 *sec*. Another man lifts the same mass to the same height in 60 *sec*. The work done by them are in the ratio

(a) $1:2$ (b) 1 : 1

(c) 2 : 1 (d) 4 : 1

64. A force of 5 *N*, making an angle θ with the horizontal, acting on an object displaces it by $0.4m$ along the horizontal direction. If the object gains kinetic energy of 1*J,* the horizontal component of the force is

(a) 1.5 *N* (b) 2.5 *N*

(c) 3.5 *N* (d) 4.5 *N*

65. If force and displacement of particle in direction of force are doubled. Work would be

(a) Double (b) 4 times

(c) Half (d) $\frac{1}{4}$ times

66. A sphere of mass *m*, moving with velocity *V*, enters a hanging bag of sand and stops. If the mass of the bag is *M* and it is raised by height *h*, then the velocity of the sphere was

(a) $\frac{M+m}{m}\sqrt{2gh}$ (b) $\frac{M}{m}\sqrt{2gh}$

(c) $\frac{m}{M+m}\sqrt{2gh}$ (d) $\frac{m}{M}\sqrt{2gh}$

67. What average horsepower is developed by an 80 *kg* man while climbing in 10 *s* a flight of stairs that rises 6 *m* vertically

(a) 0.63 *HP* (b) 1.26 *HP*

(c) 1.8 *HP* (d) 2.1 *HP*

68. An engine pumps up 100 *kg* of water through a height of 10 *m* in 5 *s*. Given that the efficiency of the engine is 60% . If $g = 10 ms^{-2}$, the power of the engine is

(a) $3.3kW$ (b) $0.33kW$

(c) $0.033\,kW$ (d) $33kW$

69. A man does a given amount of work in 10 sec. Another man does the same amount of work in 20 sec. The ratio of the output power of first man to the second man is

(a) 1 (b) 1/2

(c) 2/1 (d) None of these

70. Two point masses *m* and *M* are separated by a distance *L*. The distance of the centre of mass of the system from *m* is

(a) $L(m/M)$ (b) $L(M/m)$

(c) $L\left(\frac{M}{m+M}\right)$ (d) $L\left(\frac{m}{m+M}\right)$

71. A wheel is rotating at 900 *r.p.m.* about its axis. When the power is cut-off, it comes to rest in 1 minute. The angular retardation in *radian/s*^{2} is

(a) $\pi/2$ (b) $\pi/4$

(c) $\pi/6$ (d) $\pi/8$

72. In a bicycle the radius of rear wheel is twice the radius of front wheel. If r_F and r_r are the radii, v_F and v_r are speeds of top most points of wheel, then

(a) $v_r = 2\,v_F$ (b) $v_F = 2\,v_r$

(c) $v_F = v_r$ (d) $v_F > v_r$

73. A body is rolling without slipping on a horizontal plane. If the rotational energy of the body is 40% of the total kinetic energy, then the body might be

(a) Cylinder (b) Hollow sphere

(c) Solid cylinder (d) Ring

74. A solid sphere, a solid cylinder, a disc and a ring are rolling down an inclined plane. Which of these bodies will reach the bottom simultaneously

(a) Solid sphere and solid cylinder

(b) Solid cylinder and disc

(c) Disc and ring

(d) Solid sphere and ring

75. A solid cylinder (i) rolls down (ii) slides down an inclined plane. The ratio of the accelerations in these conditions is

(a) 3 : 2 (b) 2 : 3

(c) $\sqrt{3} : \sqrt{2}$ (d) $\sqrt{2} : \sqrt{3}$

76. The acceleration of a body rolling down on an inclined plane does not depend upon

(a) Angle of inclination of the plane

(b) Length of plane

(c) Acceleration due to gravity of earth

(d) Radius of gyration of body

77. Two particles of equal mass go round a circle of radius *R* under the action of their mutual gravitational attraction. The speed of each particle is

(a) $v = \frac{1}{2R}\sqrt{\frac{1}{Gm}}$ (b) $v = \sqrt{\frac{Gm}{2R}}$

(c) $v = \frac{1}{2}\sqrt{\frac{Gm}{R}}$ (d) $v = \sqrt{\frac{4Gm}{R}}$

78. The mass of the moon is $7.34 \times 10^{22}\,kg$ and the radius is $1.74 \times 10^{6}\,m$. The value of gravitation force will be

(a) 1.45 *N/kg* (b) 1.55 *N/kg*

(c) 1.75 *N/kg* (d) 1.62 *N/kg*

79. Two planets have the same average density but their radii are R_1 and R_2. If acceleration due to gravity on these planets be g_1 and g_2 respectively, then

(a) $\frac{g_1}{g_2} = \frac{R_1}{R_2}$ (b) $\frac{g_1}{g_2} = \frac{R_2}{R_1}$

(c) $\frac{g_1}{g_2} = \frac{R_1^2}{R_2^2}$ (d) $\frac{g_1}{g_2} = \frac{R_1^3}{R_2^3}$

80. If the earth stops rotating, the value of '*g*' at the equator will

(a) Increase (b) Remain same

(c) Decrease (d) None of the above

81. The radii of two planets are respectively R_1 and R_2 and their densities are respectively ρ_1 and ρ_2. The ratio of the accelerations due to gravity at their surfaces is

(a) $g_1 : g_2 = \frac{\rho_1}{R_1^2} : \frac{\rho_2}{R_2^2}$ (b) $g_1 : g_2 = R_1 R_2 : \rho_1 \rho_2$

(c) $g_1 : g_2 = R_1 \rho_2 : R_2 \rho_1$ (d) $g_1 : g_2 = R_1 \rho_1 : R_2 \rho_2$

82. Two planets move around the sun. The periodic times and the mean radii of the orbits are T_1, T_2 and r_1, r_2 respectively. The ratio T_1 / T_2 is equal to

(a) $(r_1 / r_2)^{1/2}$ (b) r_1 / r_2

(c) $(r_1 / r_2)^2$ (d) $(r_1 / r_2)^{3/2}$

83. A satellite *A* of mass *m* is at a distance of *r* from the centre of the earth. Another satellite *B* of mass 2*m* is at a distance of 2*r* from the earth's centre. Their time periods are in the ratio of

(a) 1 : 2 (b) 1 : 16

(c) 1 : 32 (d) $1 : 2\sqrt{2}$

84. Planetary system in the solar system describes

(a) Conservation of energy

(b) Conservation of linear momentum

(c) Conservation of angular momentum

(d) None of these

85. In the solar system, which is conserved

(a) Total Energy (b) K.E.

(c) Angular Velocity (d) Linear Momentum

86. A body revolved around the sun 27 times faster than the earth what is the ratio of their radii

(a) 1/3 (b) 1/9

(c) 1/27 (d) 1/4

87. Which of the following astronomer first proposed that sun is static and earth rounds sun

(a) Copernicus (b) Kepler

(c) Galileo (d) None

88. The orbital angular momentum of a satellite revolving at a distance *r* from the centre is *L*. If the distance is increased to 16*r,* then the new angular momentum will be

(a) 16 *L* (b) 64 *L*

(c) $\frac{L}{4}$ (d) 4 *L*

89. Suppose the law of gravitational attraction suddenly changes and becomes an inverse cube law i.e. $F \propto 1/r^3$, but still remaining a central force. Then

(a) Keplers law of areas still holds

(b) Keplers law of period still holds

(c) Keplers law of areas and period still hold

(d) Neither the law of areas, nor the law of period still holds

90. If orbital velocity of planet is given by $v = G^a M^b R^c$, then

(a) $a = 1/3, b = 1/3, c = -1/3$

(b) $a = 1/2, b = 1/2, c = -1/2$

(c) $a = 1/2, b = -1/2, c = 1/2$

(d) $a = 1/2, b = -1/2, c = -1/2$